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U.S. DEPARTMENT OF AGRICULTURE

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STOPPING THE CODLING MOTH, Page 8

AGRICULTURAL
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We Need More Scientists

Scientists are one of the Nation's most important resources. But we are short of this brainpower today and each year competition is keen for new college graduates trained in science.

This competition is especially fierce in agriculture which draws on all the sciences. For some time there have been about twice as many jobs as graduates to fill them.

Urbanization aggravates the problem. With each passing year there are more youngsters who have never visited a farm, much less grown up on one. And understandably these youngsters equate agricultural careers with "farming." If we are to continue our progress in agriculture, a good share of tomorrow's scientists will have to come from our urban and suburban communities.

Agriculture must sustain an aggressive recruiting campaign to meet its manpower needs in both quantity and quality. This campaign should be directed ideally at high school students whose career choices are still open. Our readers, both in and out of ARS, can play important recruiting roles in their home communities.

Teachers are in an excellent position to encourage students who show aptitude. ARS now supplies science classes with information, projects, and experiments in the field of agricultural science. And last fall, 30 ARS stations around the country held Open House, affording thousands of high school students a first hand look at science in action.

Scientists everywhere can participate in their local high school's Career Day, or perhaps prepare informational materials so that guidance counselors can give students an idea of the many science careers open in agriculture.

All of us can help close the information gap on science careers in agriculture, whether by speaking before civic groups, button-holing the local newspaper editor, or most important of all—encouraging the apt young people we meet in our daily lives to prepare for satisfying careers in research.

CROPS

ENGINEERING

INSECTS

LIVESTOCK

NUTRITION

MARKET QUALITY

SOIL AND WATER

AGRISEARCH NOTES

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Orville L. Freeman, Secretary
U.S. Department of Agriculture

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Left: Carlos Lamar, Jr., (right) and technician Barbara Immes use a microsyringe to inject wildfire toxin directly into the brain of a rat. The injection technique, which puts less than a drop of material into the brain, was developed by Lamar, a specialist in neural pathology (PN–1653). Below: Plant pathologist R. D. Durbin (right) and technician J. L. Detra inject the toxin into a tobacco leaf (PN–1654).

WILDFIRE Plant disease study may lead to cause of human epilepsy

A BACTERIAL TOXIN that causes a serious tobacco disease is now known to cause convulsions in rats and mice, and this knowledge may help scientists find the cause of human epilepsy.

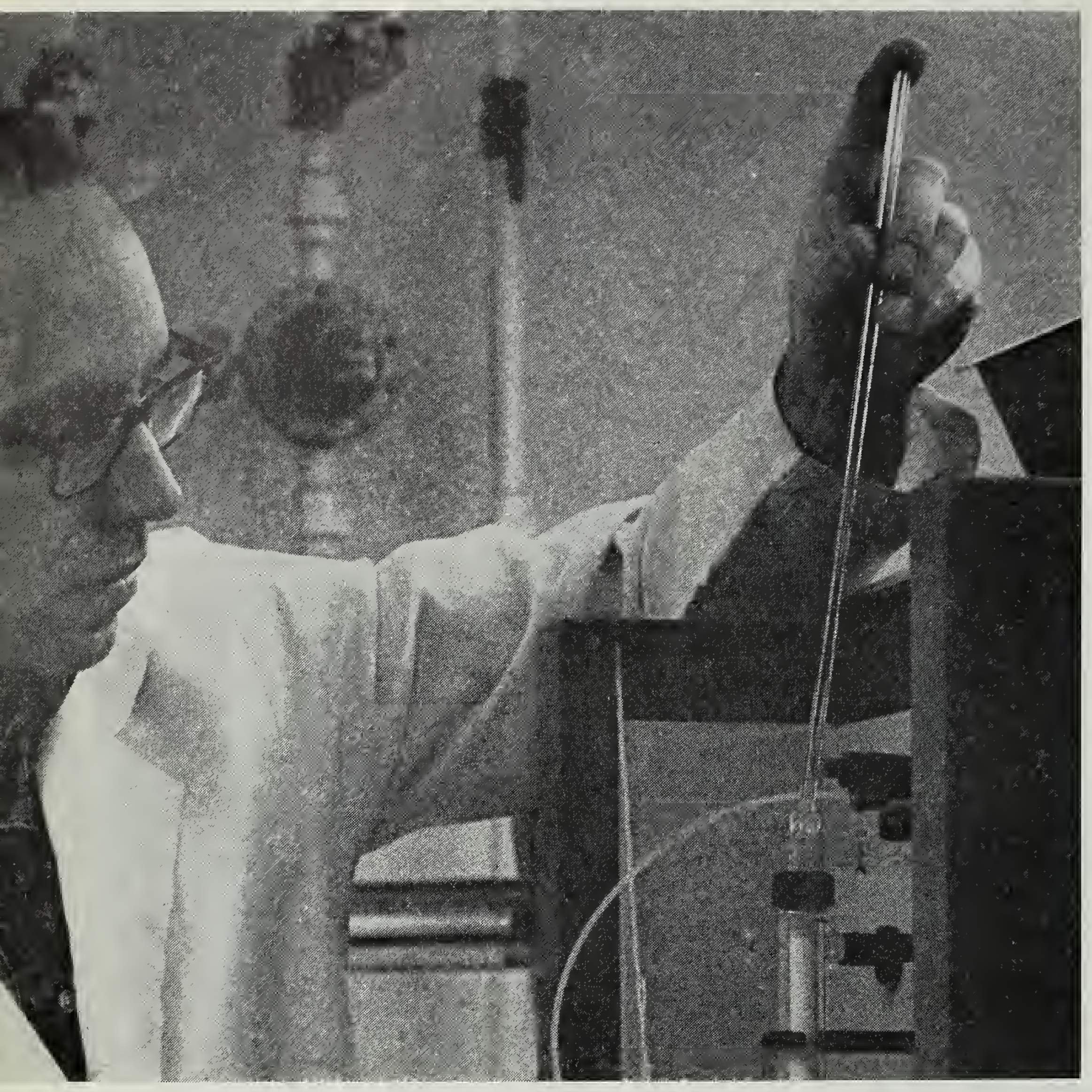
In tobacco, the disease is called "wildfire" because it sweeps rapidly through a field, killing the plants as though they had been burned by a flame thrower.

In animals, the toxin causes convulsions very similar to epileptic seizures.

Investigating the toxin, an ARS research team at Madison, Wis., learned that it inhibits the action of an enzyme (glutamine synthetase) found in the leaves of plants and the brains of animals. In plants, the inhibition of glutamine synthetase causes a rapid buildup of ammonia and other closely related compounds. This is what produces the visible symptoms of tobacco wildfire.

The scientists do not yet know how the inhibition of glutamine synthetase is related to convulsions in rats and mice, but the evidence indicates that the inhibition causes the epileptic-like seizures.

Plant pathologists S. L. Sinden and R. D. Durbin, microbiologist T. F. Uchytil, and biochemist Carlos



Durbin applies toxin sample to the amino acid analyzer to determine the amount and purity of the sample. Wildfire toxin is chemically similar to amino acids. (PN–1655).

Plant pathologist S. L. Sinden (left) and Detra separate the bacterium from the toxin with a centrifuge (PN–1656).

Lamar, Jr., also an M.D., conducted the studies on the toxin, which is produced by the bacterium *Pseudomonas tabaci.*

In the tests, the team first grew a highly pathogenic culture of the bacterium in large tanks and then extracted the toxin. After purifying the toxin, they injected it into rats and mice at different dosage levels.

Microgram dosages of the toxin caused non-lethal convulsions 4 to 24 hours after administration. At intermediate dosage levels, convulsions occurred earlier and several of the animals died. With higher doses the convulsions occurred after 3 hours and none of the animals survived.

The toxin's structure is altered by heating, and the heated toxin did not cause convulsions in the animals nor disease symptoms in plants.

The scientists have not yet fully identified the chemical structure of the toxin that causes the convulsions and the tobacco leaf damage. They hope, however, that further studies will lead to the complete identification of the substance, as well as an understanding of how it works, thereby contributing to a basic understanding of plant and animal diseases. ■

To prepare a culturing tank for the bacterium, microbiologist T. F. Uchytil (left) and Detra mix solutions of sugar and salt growth mediums. (PN–1657).

SNOW MOLD... Resistant Wheats Closer

PROGRESS IS ENCOURAGING in ARS efforts to isolate wheat breeding material with resistance—or at least tolerance—to snow mold.

This virus disease, which may reduce or kill stands of winter wheat during the dormant stage of growth, causes losses to growers in States subject to early and heavy snowfall.

ARS and Idaho Agricultural Experiment Station researchers at Aberdeen and Tetonia, Idaho, are currently screening selections of winter wheat from USDA's World Collection of Wheat at Beltsville, Md., in a search for resistant or tolerant breeding material.

In 1960, the researchers planted 4,800 varied wheats at three Idaho locations where snow mold is normally prevalent. Then, 5,000 spikes were selected from surviving plants in a field where 90 percent of the plants had been killed. Through extensive testing of several generations of progeny derived from these spikes, the researchers found 20 promising selections. During the experiments, the plants were exposed to a heavy infection of *Typhula,* and a light infection of *Fusarium,* fungi responsible for snow mold.

Later the 20 Idaho selections along with 5 of the most promising Washington selections (identified in similar tests in that State) and Itana, a susceptible winter wheat, were grown in a replicated trial at the Tetonia station.

Ten of the 20 Idaho selections were found as susceptible to snow mold as Itana. Among the remaining selections, the spring recovery of plants ranged from 4 to 50 percent.

Spring recovery is determined by the percentage of plants in each row showing green leaves soon after the snow melts (May 14 in these trials). It is during this critical period that farmers must decide whether or not to replant.

Total survival among the same selections, in terms of plants growing on June 14, ranged from 30 to 70 percent. ■

Agronomist D. W. Sunderman points out spring recovery of snow mold tolerant selections. Row on left shows good spring recovery; row on right is dead (PN–1658).

ORGANISMS THAT CAUSE two highly destructive diseases of chickens lack body structures for locomotion, yet laboratory studies show that they can invade the shells of chicken eggs in 5 to 30 minutes.

This ARS research finding gives additional insight into how organisms causing chronic respiratory disease and Newcastle disease in poultry may be transmitted.

Neither agent had ever been reported to penetrate the shell of eggs under natural conditions. In the tests, most of the invaded eggs were either cracked or contaminated at an "open" area on the shell.

ARS veterinarian J. E. Williams and laboratory technician L. H. Dillard demonstrated the egg penetration pattern of the two organisms at the Southeast Poultry Research Laboratory, Athens, Ga. One, a *Mycoplasma* causing chronic respiratory disease, is intermediate between a bacterium and a virus; the other, a virus, causes Newcastle disease.

Williams and Dillard prepared aluminum cylinders containing sterile chicken feces that had been infected with the organism. Then they attached the cylinders to the shell surface with melted paraffin, as in Williams' previous study on the penetration of Salmonella bacteria into chicken eggs (AGR. RES., March 1968, p. 6).

The test eggs were incubated at 99° F. and 60 percent humidity, closely duplicating the environment in commercial egg incubators.

The researchers took samples to study penetration at set intervals from 5 minutes to 48 hours for *Mycoplasma*, and from 30 minutes to 48 hours for the virus.

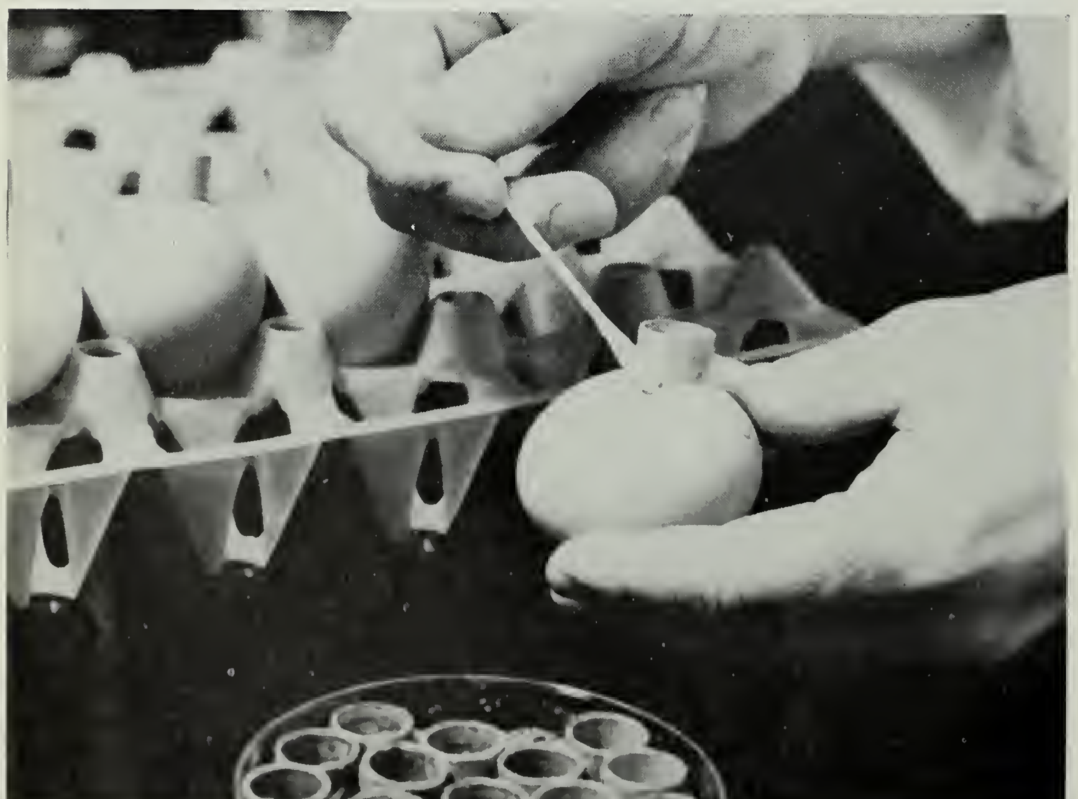
In 5 minutes, *Mycoplasma* penetrated the cuticle and shell of about 17 percent of the eggs with preselected test areas. After 3 hours of incubation, it had also penerated the membranes below the shell of about 3 percent of the 26 cracked eggs.

The virus, on the other hand, was inside the cuticle and shell of 82 percent of the cracked eggs in 30 minutes and had invaded the outer shell membrane of 10 percent of the eggs in 24 hours. Neither organism survived in the outer egg structures during extended incubation.

The researchers say it is conceivable that even at lower temperatures in laying houses and egg coolers, penetration can occur in the outer egg structures by organisms without means of locomotion. This possibility will be investigated in future ARS studies. ■

POULTRY DISEASE AGENTS

. . . Non-Motile yet Penetrate Eggs



Left: Aluminum cylinders are pressed into sterile chicken feces and attached to the eggshell with paraffin (PN—1659). Right: The eggshells are then contaminated by adding two drops of a suspension of the disease agent to the cylinder (PN—1660).

Kling selects larvae for tests. He will check kill rate after 7 to 8 days (PN–1662).

Coming: Oral Insecticides for Dairy Cattle

CERTAIN INSECTICIDES FED to dairy cattle can help control flies without contaminating milk.

These insecticides are directed, not against the adult fly, but against the larvae of the next generation. The insecticides pass through the cow into the manure, where stable flies, horn flies, face flies, and house flies normally spend their larval stage.

The technique, long used with beef cattle, has not been practical for dairy cattle, because of the residue problem. Although the insecticides do not leave residues in meat, they do in milk. ARS tests at Beltsville, Md., therefore, began by screening a great variety of organic phosphates to find some that kill larvae without contaminating milk.

ARS dairy nutritionist R. W. Miller says the most promising insecticide tested so far is Gardona, a relatively inexpensive commercial compound (phosphoric acid, 2-chloro-1-[2,4,5-trichlorophenyl] vinyl dimethyl ester).

Researchers fed Gardona in a complete feed for 7 days. At concentrations of 24 p.p.m. (parts per million), Gardona killed 94 percent of the larvae seeded into the manure. Concentrations of 36 p.p.m. killed 100 percent of the larvae. Miller says this degree of kill is amazing, considering that only 1 percent of the Gardona concentration in the feed reaches the manure. The remainder apparently is broken down into harmless metabolites.

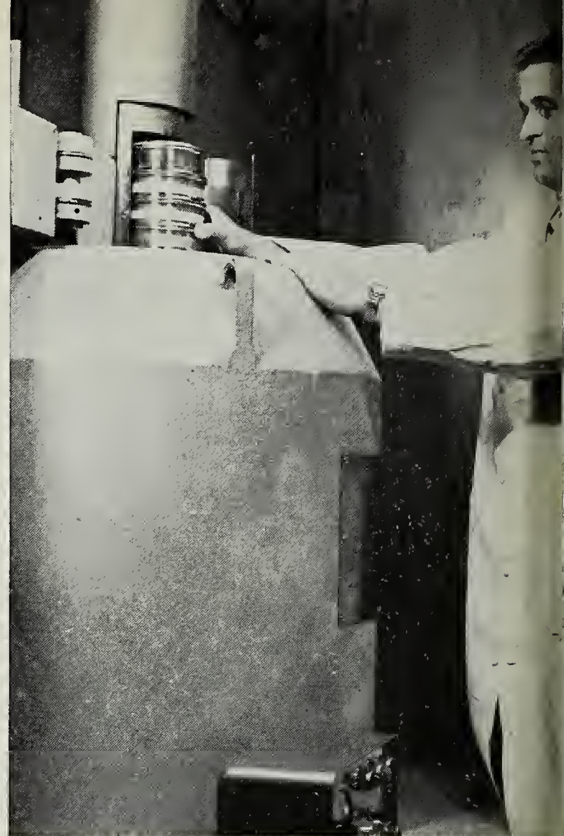
Laboratory assistant R. C. Kling seeds housefly larvae into manure samples to check effectiveness of insecticides. Larvae are minute so magnifier helps promote accurate placement of 25 larvae per sample (PN–1661).

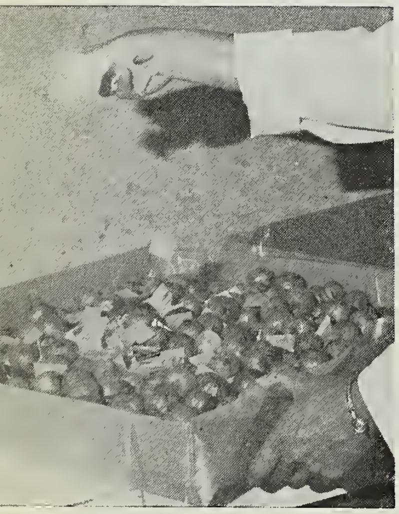
Gardona proved to be a relatively safe chemical. No residue appeared in the milk, even when the concentration was stepped up to 60 p.p.m. Concentrations a thousand times higher than those needed to kill larvae did not harm the livestock or the person handling the pesticide.

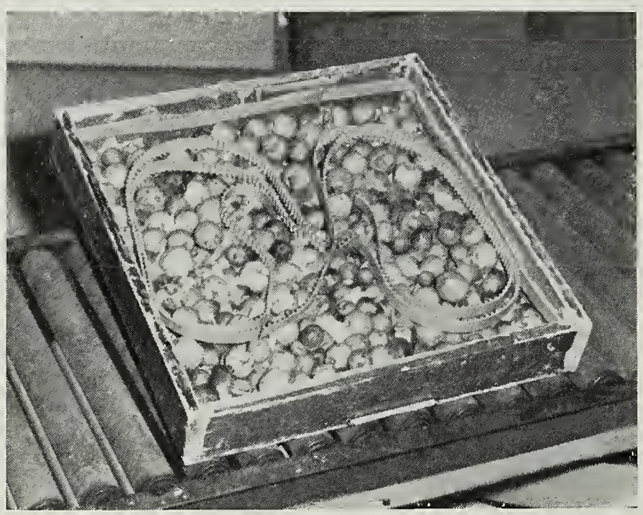
Gardona levels fed to cattle could possibly be reduced, thanks to a chance occurrence during tests with silage as the carrier for Gardona. When Miller treated chopped corn plants at the silo, he intended to get 48 p.p.m. in the finished silage. The actual level turned out to be no more than 13 p.p.m., but still high enough to kill all larvae seeded on manure from cows that ate the silage.

Apparently, Gardona fed in silage kills larvae at lower levels than Gardona fed in other rations. Future experiments will check the reason for this apparent difference.

Final approval for Gardona in dairy cattle feed is still some time off, Miller cautions. First, the optimum level and method of feeding Gardona must be set, based on the needs of commercial farms. Second, research must be done on how well and how safely Gardona performs when fed throughout the fly season. ■







Top: Laboratory aide Lois Queen opens bags containing 65 pairs of moths each. Moths have mated and laid eggs on the sides of the bags. (PN–1663). Left: The bags are cut into small squares and placed in trays of cull apples. After hatching, the larvae bore into the apples and develop until ready to spin cocoons (PN–1664). Right: Corrugated strips are placed on the apples to provide pupation sites for the larvae (PN–1665).

Codling moths are a threat mainly to the Nation's $260 million apple crop. However, the pests also attack pears and English walnuts. Although conventional insecticides are highly successful against these pests, entomologists seek other control methods in case the insects develop resistance to the insecticides. Moreover, many insecticides directed against codling moths kill beneficial insects and mites that attack other orchard pests.

Stoppin

CODLING MOTHS—the cause of wormy apples—virtually disappeared from a 93-acre orchard without application of a single drop of insecticide.

ARS entomologists controlled the pests by releasing 1 million sexually sterile male codling moths between April and September, enough to outnumber the native counterparts by a ratio of 62 to 1.

The released moths, sterilized by exposure to radioactive cobalt, retained their normal mating instincts, but eggs produced from matings of sterile and native moths were infertile. The technique poses no threat to crops or to man—the moths do not become radioactive nor do they feed on fruit when released. Entomologist B. A. Butt headed the project at the ARS laboratory in Yakima, Wash.

The sterile releases gave 99 percent control, a record equal to that of conventional insecticides in a nearby

Left: Entomologist L. D. White places canned codling moths into the unit which sterilizes the insects with radioactive cobalt. Each of the four cans placed in the unit contains 5,000 moths (PN–1666). Right: Red-dyed, sterilized moths are placed in boxes for release over infested apple orchard. Boxes open automatically as they descend from the aircraft (PN–1667). Helicopters were used in 1967; tests are being repeated this year, using airplanes (cover photo PN–1675).

the Codling Moth

orchard. Insecticides for codling moth control are usually applied 3 or 4 times a season in the Yakima area. Insects ruined 40 percent of the fruit in another orchard employing no controls.

Nature gave a helping hand in the experimental orchard: Beneficial insects and mites controlled European red mites and woolly apple aphids. Insecticides applied to control codling moths and other destructive insect pests often kill these naturally occurring enemies.

Butt and his staff are continuing the experiments this summer; they are testing improved methods of mass-producing, sterilizing, and releasing the moths. Although last year's tests were the largest and most encouraging in 7 years of experiments at Yakima and nearby orchards, further testing will be needed after this year's experiments end.

Costs for using the sterile-release method on a commercial scale, for example, can be determined only through conducting experiments in orchards larger than those used so far. Experience is also needed under the various commercial conditions encountered by fruit growers.

Unlike conventional control programs, success of the sterile-release method would depend heavily on group action by growers to minimize infestations of codling moths over an entire treatment area. Even the cooperation of noncommercial growers and officials in charge of public lands would be important.

Fruit trees along roadsides and in parks or backyards are potential reservoirs of codling moth infestations that could doom the control program if these trees were not adequately sprayed or removed.

The Washington Agricultural Experiment Station is cooperating in the ARS sterile-release tests. ■

Butt distributes traps baited with female codling moths throughout experimental orchard. Trapping provides way to estimate extent of infestation and to determine whether sterilized moths dispersed. Sterilized moths are dyed red for identification (PN–1668).

Fortified Wheat Flour ...Newest

WHEAT FLOUR FORTIFIED with wheat flour is the newest food product being shipped to developing countries in the Food for Freedom program.

Wheat flour fortified with . . . wheat flour? Yes, the product is 70 percent ordinary wheat flour and 30 percent high-protein wheat flour to which calcium and vitamin A have been added. The mixture not only contains 25 to 30 percent more protein than ordinary flour, but the protein is of higher quality.

USDA has purchased 12 million pounds of the unusual product, known as Protein Fortified Wheat Flour Blend A, for distribution to India and Iran, marking the first large-scale commercial use of the protein concentrate. India will get about 8.5 million pounds and Iran, 3.5 million.

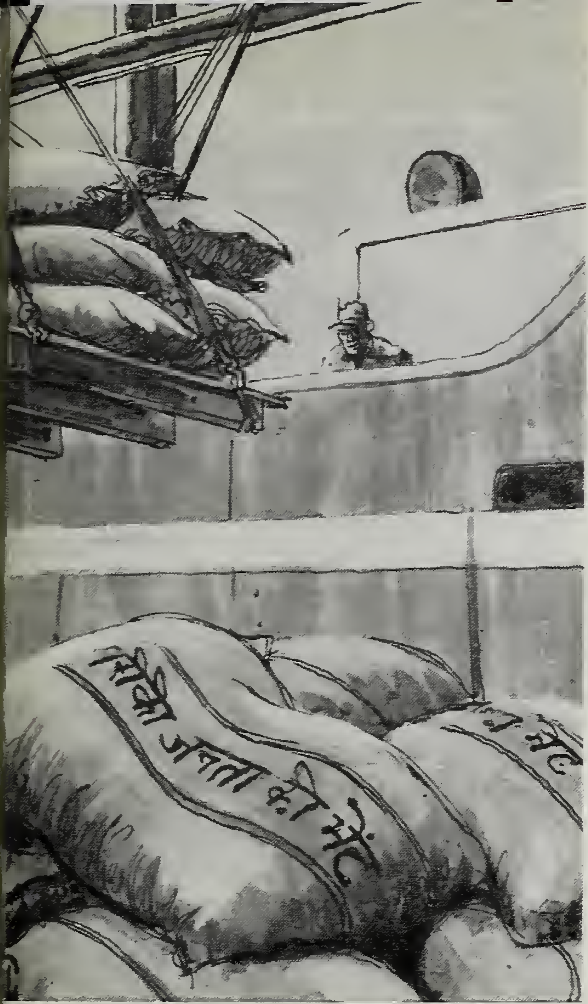
The high-protein flour or concentrate is obtained by taking coarse byproducts of the regular flour milling process and running them through the mill a second or third time. Some 5 million tons of these protein-rich byproducts are produced in the United States each year. They have served as a source of low-cost protein for livestock feed, but some go into the production of breakfast cereals. The unrefined byproducts are usually too fibrous and dark-colored to be attractive as human food.

Techniques for re-milling these byproducts to make a flour similar to ordinary flour in appearance and texture were developed by ARS scientists at the Western utilization research laboratory, Albany, Calif., cooperating with the milling industry.

With the ARS-developed process, millers can recover 20 to 30 percent of the byproducts in the form of high-protein flour or concentrate. A typical analysis is 23.4 percent protein, 2.0 percent fiber, 6.8 percent fat, and 3.5 percent ash.

Specifications for the concentrate call for a minimum of 20 percent protein.

ARS scientists say the relatively low fiber content, light color, and flavor of the concentrate make it especially suitable as a source of protein for fortifying bread flours. Tests carried out in Pakistan, India, and Near and Mideast Asian countries indicate that such blends make good quality local breads such as ballady bread, the popular Arab round loaf, and satisfactory



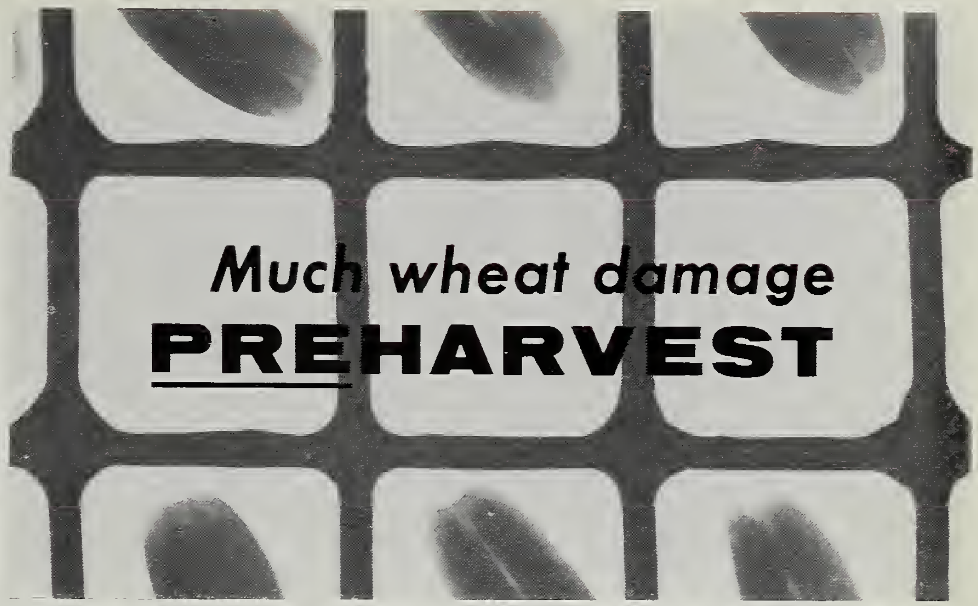
food for freedom

breads and biscuits of the type that is baked in India.

Besides fortifying ordinary flour, the concentrate is also going into a new wheat-based formulated food which has been tested in 19 developing countries. The Department recently purchased 2.8 million pounds of this new product for distribution abroad.

The concentrate can also improve the protein content and quality of pasta products, local baked goods, and other formulated foods.

In addition, the flour can be included in products suitable for children and in foods for other nutrition programs operated by voluntary agencies and foreign governments. USDA anticipates that the protein concentrate will go into other products being developed for overseas distribution. ■



Much wheat damage **PREHARVEST**

DON'T BLAME THE FARM combine or postharvest handling for all the damage to wheat. Studies conducted under a cooperative agreement between ARS and Kansas State University show that much of the internal damage occurs before harvesting.

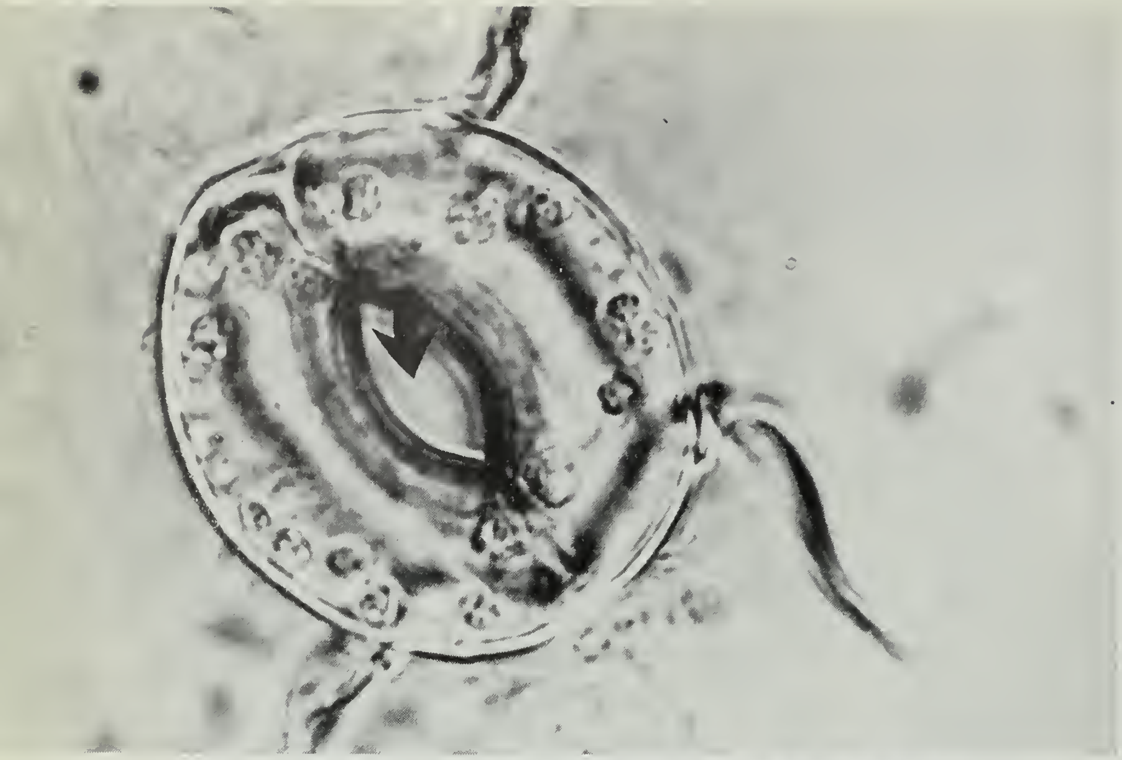
Lowered grain quality due to substantial amounts of broken and cracked wheat kernels causes significant economic losses throughout the grain industry. Most investigations into the causes of this physical damage have been concerned with external damage from harvesting, handling, drying, and storage methods. However, researchers who tested wheat samples immediately before and after harvesting by combine and by hand say that several other factors such as wheat variety, growing location, and year of growth are responsible for much of the damage.

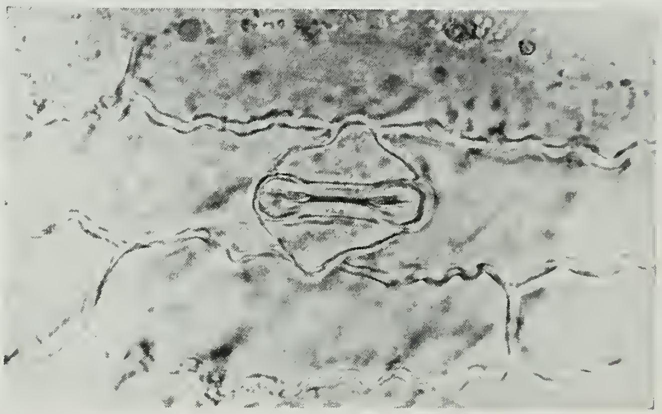
To study wheat damage as affected by variety, location, harvesting method, and year of growth, researchers used several Kansas hard red wheat varieties grown in 1966 and 1967. The factors were tested individually and in combination, and X-ray radiographs were used to examine samples for internal damage.

The tests revealed that all factors contributed to internal damage in the field before harvesting, and the damage was intensified by abnormal environmental conditions during growing seasons, such as extreme wet and dry cycles and temperature variations.

In the 1966 crop, total internal damage in hand-harvested wheat samples ranged from 0 to 30 percent. In 1967, a year of abnormal weather conditions, the damage in hand-harvested wheat samples ran as high as 100 percent. In most cases, combine operations, rather than initiating original damage, tended to increase the amount of multiple cracks in wheat already containing single and multiple cracks. In addition, weakened kernals are probably more susceptible to disease and to the added damage that can occur during handling, drying, and storing.

The experiments indicated that, though improved harvesting and post-harvest handling procedures are essential in the retention of wheat quality, continued research is needed to develop hardier strains of wheat less affected by environmental conditions. ■





Above: Stomate on a bean leaf greatly enlarged. This stomate is representative of those in most evergreen and deciduous plants (PN–1671) Right: A typical stomate on a corn leaf under magnification. (PN–1672).

Leaf Pores

Main exit for our water supply

MOST OF THE WATER leaving the land doesn't exit via rivers, faucets, drains or evaporation—it escapes through microscopic pores in plant leaves.

A canopy of corn leaves, with about 40,000 pores (stomata) per square inch of leaf, for example, gives off eight-tenths as much water as the surface of a lake the same size.

How to slow down this process, called transpiration, without fouling up plant growth is a goal of Connecticut Agricultural Experiment Station soil scientist P. E. Waggoner and ARS plant physiologist J. E. Pallas, Jr., at Watkinsville, Ga., working in cooperation with the Georgia Agricultural Experiment Stations.

The stomata close at night or in times of drought, thus conserving the water in the plant. Although some stomatal action can be regulated chemically, scientists are trying to improve and modify this action in other ways. Finding out how the modification can be done easily, efficiently, and safely is part of the problem facing the scientists.

In one test, a group of 30-year-old pines, 50 feet high, was treated chemically by spraying them with phenylmercuric acetate from a helicopter. Some 20,000 gallons of water per acre were saved during the period between June 1 and October 1. It was as if 0.8 inch of rain had fallen on the treated area.

Better use of soil water, especially in arid locations where no irrigation is available, would be one use of transpiration suppressants, Pallas says. Other uses include:

- Reducing transpiration from a watershed to increase streamflow and water harvest.
- Prolonging the availability of soil water on planted lands where yield is not important, such as golf courses and lawns.
- Decreasing evaporation until roots are established in transplanting operations.
- Increasing or assuring a yield by applications before stages of growth, such as tasseling and silking in corn, when plants are extremely susceptible to drought damage.
- Improving fruit quality by increasing plumpness or decreasing the cracking induced by transpiration.
- Improving the quality of fruit, vegetables or flowers during storage.
- Preserving Christmas trees and other ornamentals to decrease the fire hazard.

Some of these uses are being practiced on a limited scale, others are being investigated, and some have yet to receive attention. ■

Bedload Sediment—how much?

A GAP IN KNOWLEDGE about transport of sediment in streams may become narrower through research with a newly developed automatic bedload sediment sampler.

Bedload—sediment rolling or sliding in continuous contact with the streambed—is one of the three ways in which a stream carries sediment. Sediment is also carried suspended in water and bounced along the streambed (saltation).

Unlike suspended sediment, which is easily caught in other types of collectors, bedload has been difficult to measure accurately. The new sampler, developed to overcome this problem, should help provide researchers with measurements of all the sediment carried in a stream. And many heretofore unknown phenomena will probably be observed when the instrument is used in conjunction with conventional equipment.

The new sampler moves along a track on the downstream side of a runoff measuring flume. It is powered by an electric motor and chain with a varidrive system which allows various transverse speeds across the flume.

The sampler has an intake section with a 1- by 12-inch slot that extends vertically up into the water coming off the flume. It catches samples that range in size from pinpoint to one inch. The unit is designed to withstand flows up to 30 feet per second.

A boxlike structure at the base of the intake holds six graded sieves (.064 mm. to 2.52 cm.) which remove the sediment and allow the water to run out the bottom. After the device makes a pass, these sieves are removed and replaced with clean ones. Sediment is cleaned from the sieves, recombined, and packaged for the laboratory.

On a V-floor flume, the sampler makes its pass to the center and returns, sampling half the width twice. On a flat-floored structure, it can be made to travel the entire width.

Large-sized materials coming in at high velocity may occasionally damage the sampler. Clogging may also be a problem. ARS scientists believe, however, that these possibilities are minimal. Spare parts are kept on hand for quick replacement.

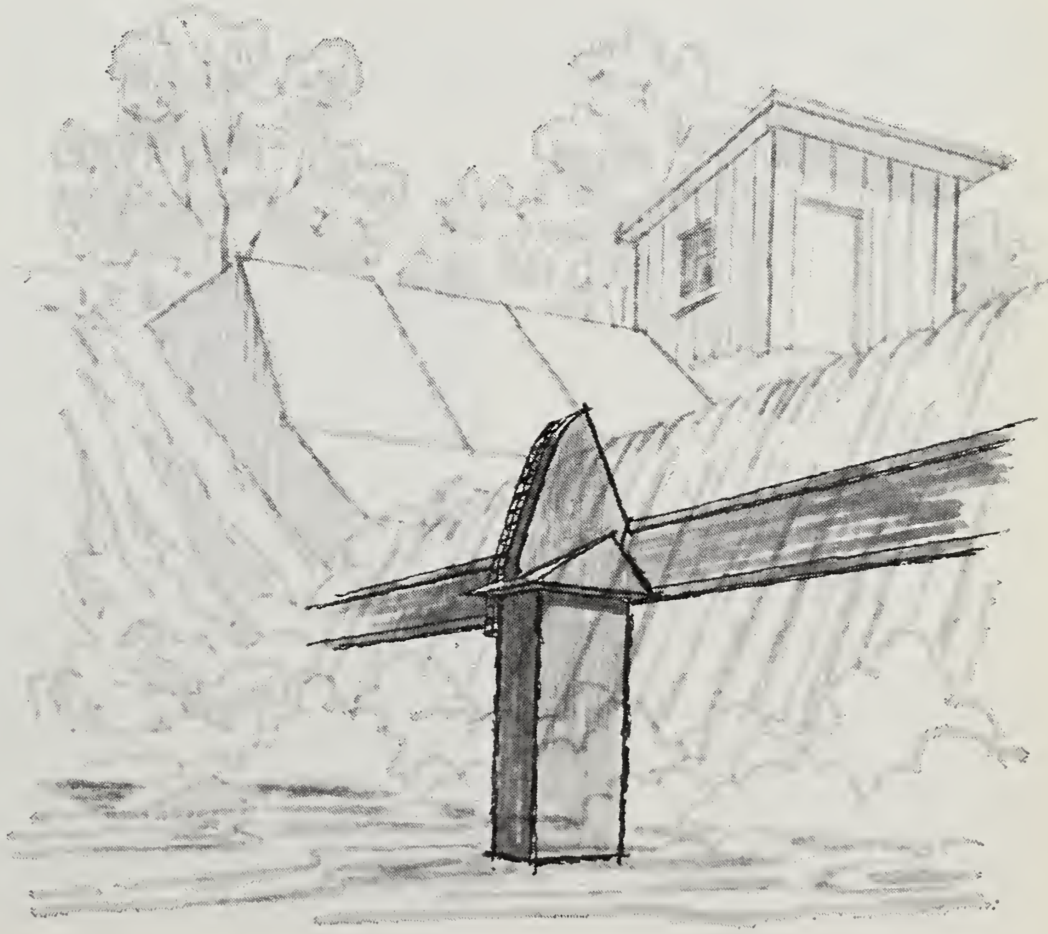
When flow rates are fluctuating greatly, it is imperative to make quick changes of the sieves to provide a complete water-sediment discharge relationship. Best time so far has been something over 3 minutes.

Any small weir, dam, or other structure where a free-falling nappe (sheet of water) occurs can be fitted with the sampler.

To collect larger samples, the researchers plan to modify the instrument to include a 4-inch slot alongside the present 1-inch opening.

In tests during the last runoff season, three small flows were recorded with good results.

ARS geologist Fred Libby at the USDA Southwest Rangeland Watershed Research Center, Tucson, Ariz., and co-researchers are working in cooperation with the Arizona Agricultural Experiment Station. ■



Preharvest Spray Firms Cherries

On hot days, sour cherries sprayed with cold water before mechanical harvest yield substantially more processed product.

Sour cherries may become soft and bruise easily in hot weather, sometimes forcing the grower to temporarily stop harvesting. ARS researchers in Michigan, however, found that spraying the cherries with cold water firms the fruit and greatly reduces bruising. In tests during the 1966–67 seasons, yield of final processed product averaged nearly two percent more with sprayed than with nonsprayed sour cherries.

In addition, when sprayed cherries were placed in soaking tanks for cooling and firming after harvest, they lost 0.79 percent less weight than nonsprayed cherries. The resultant savings to the grower just about equaled the additional cost of labor and fuel for spray cooling.

Processors may pay a premium price for spray-cooled sour cherries when crops are small, but because of the superior yield in final processed product, they also benefit. According to 1967 projections, a processor with a season volume of 5,000 tons would have realized about $20,000 more from spray-cooled sour cherries.

The researchers recommend that growers follow these steps to get maximum benefit from preharvest spraying:

- Use an air-blast sprayer and spray only when orchard temperature is higher than 82° F.
- Spray trees 20 to 30 minutes before harvesting.
- Apply water for a minimum of 30 seconds on both sides of the tree. (Cooling is more efficient if the water is applied in two 15-second periods separated by a 10-minute interval. This allows cherries to take full advantage of cooling by conduction—from contact and evaporation of water on skins of fruit.)
- Keep water at a temperature of 50° F. or less and apply it at a rate of 20 gallons per minute.

The tests were conducted by agricultural engineers R. G. Diener and J. H. Levin, and biochemist R. T. Whittenberger. The Michigan Agricultural Experiment Station cooperated in the research. ■

Safer Technique for ULV Spraying

A system now used for convenience in research will ultimately make the handling of pesticides in ultra low-volume ground sprayers safer for farmers.

The concentrated chemicals are inherently more hazardous than diluted mixtures used in conventional sprayers. Normally, these chemicals are poured from the original container into a reservoir on the sprayer with the possibility of accidental human contact and contamination by trash and dirt. Researchers are now using the original container as the basic part of reservoir apparatus, reducing the chance of human contact and the incidence of clogged spray orifices.

Because a low flow rate and no recirculation are required on ULV ground sprayers, air pressure is used to force the liquid through the nozzles. Pressure is commonly provided by a small air compressor or carbon dioxide cylinder that forces the liquid from the reservoir through a tube. The researchers advise that a safety pop-off valve should always be used with a compressed gas cylinder.

Major components of the new system are: (1) the original pesticide container, (2) upper and lower plates with threaded studs to hold the container securely, (3) aluminum input-output adapter with a 10-pound-per-square-inch pop-off valve in the supply line, and (4) a metal safety shroud for the container. The safety shroud was added to protect against the possibility of accidents.

Using the system, researchers need less than 10 minutes to remove one spray container from a ULV ground sprayer, flush the system, and install another container. Field performance was highly satisfactory in tests during 1966 and 1967.

Agricultural engineers D. B. Smith and E. C. Burt, developers of the system, suggest that the equipment be operated at a pressure of 10 pounds per square inch. This pressure gives the operator a reasonable margin of safety against explosion of the container under pressure.

Tests were conducted at the USDA Boll Weevil Research Laboratory, State College, Miss. The Mississippi Agricultural Experiment Station cooperated. ■

First Lady Presents Morrison Lecture

Mrs. Lyndon B. Johnson presented the first in a series of lectures commemorating B. Y. Morrison, creator of the famed Glenn Dale azalea and first director of the National Arboretum.

Mrs. Johnson, described in her nomination for the lecture as the "single most powerful influence on ornamental horticulture that this country has ever known," spoke June 26 at the national convention of the American Institute of Architects in Portland, Oreg. Her appearance highlighted the NATURE session of the 1968 conference theme, MAN/ARCHITECTURE/NATURE.

Following the presentation, Secretary of Agriculture Orville L. Freeman introduced two hardy new azaleas to the horticulturists and landscape architects. One is being named "Mrs. LBJ" in honor of Mrs. Johnson and the other, "Ben Morrison," in honor of B. Y. Morrison who had found it as a seedling growing at the U.S. Plant Introduction Station, Glenn Dale, Md.

The Morrison lectures were established by ARS to recognize and encourage outstanding accomplishments in the science and practice of ornamental horticulture. They will be given annually by individuals chosen for significant contributions in the field.

As scientist, landscape architect, plant explorer, author, and lecturer, Morrison (1891–1966) advanced the science of botany in the United States and gave the American public dozens of new ornamentals. He was internationally known for his work with daffodils and iris.

Mrs. Johnson talks with G. W. Irving, Jr., ARS Administrator (right), and R. L. Durham, AIA president. She spoke on the New Conservation, a concern for the total environment (PN–1674).

Removing Pesticide Residues at Home

Pesticide residues on tomatoes reaching the market are well under allowances set by law to protect the consumer. And even these small amounts are reduced by handling methods used by housewives and commercial food packers.

Although such residues are minute and measured in terms of parts per million or billion, ARS food specialists wanted to know the effect of various home preparation and commercial processing procedures on fruits and vegetables grown with the aid of such commonly used pesticides as DDT, malathion, and carbaryl. To get this information, a contract covering a series of studies was awarded the National Canners Association (NCA) Research Foundation.

The first NCA report showed the already low residues of DDT, malathion, and carbaryl on tomatoes were reduced to near zero by ordinary home and commercial handling methods. Kitchen washing with cold water removed most DDT and carbaryl but little of the malathion; however, peeling removed the residues of all three of the pesticides. Hot water immersion was the most efficient peeling method. Adding detergents to the wash water did not materially affect the efficiency of pesticide residue removal. Storing the tomatoes did not reduce DDT or carbaryl but did decrease malathion residues. Cooking, as such, accomplished little in the removal of remaining residues.

Scientists worked with three plots of tomato plants grown especially for the tests. Each plot was treated with one of three pesticides: chlorinated hydrocarbon (DDT); organophosphate (malathion); and carbamate (carbaryl). The spray program included three applications each for DDT and carbaryl and five for malathion. In each case plants were sprayed shortly before harvesting to insure the presence of residues at, or slightly higher than, the residue allowed by the Food and Drug Administration.

Each experimental plot yielded about 300 pounds of tomatoes. Half of these were shipped by air to the NCA laboratory at Washington, D.C., on the afternoon of the same day they were picked, while the others were

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processed the following day by NCA scientists at the Berkeley, Calif., laboratory. NCA personnel in Washington evaluated the tomatoes in terms of home preparation and cooking procedures—washing, peeling, and home canning—while the Berkeley group carried out practices followed by the food industry.

In the case of DDT, more than 75 percent of the residue was removed by either home-type cold water washing or by commercial washing methods. Virtually all of the detectable residue was eliminated when the fruit was peeled after immersion in boiling water or following commercial canning and juicing operations.

Doubled Azaleas Larger, Tougher

Larger azalea plants and flowers may soon be available to gardeners through treatments that double the number of chromosomes within the plant cells.

ARS horticulturist R. L. Pryor and

technician L. C. Frazier produced the improved azaleas by treating the plants with colchicine, a solution extracted from fall-flowering crocus bulbs. Flowers were not only larger but lasted longer on plants with the double chromosome number. And since doubling the chromosomes doubled the size of each plant cell, leaves and stems were thicker and tougher. Flower colors were also more intense, and the improved azaleas show promise for adding new color and toughness to the species.

This is the first successful attempt to induce a double chromosome number, called tetraploidy, in azaleas. Previous ARS colchicine treatments induced tetraploidy—and larger plants and flowers—in lilies, daylilies, poinsettias, carnations and roses.

Shoots from the treated azaleas were rooted, and researchers selected the tetraploid plants by comparing measurements of pollen grains from test plants and from normal plants. Tetraploid pollen is larger. Pollen can easily be measured, Pryor notes, but structural leaf changes are hard to detect and measure objectively.

Field-Cleaning Seed Cotton

Seed cotton may soon be partially cleaned while harvested, substantially reducing the amount of trash to be disposed of at the gin.

Cleaned at the gin, cotton must be run through two or more types of cleaners to separate it from sticks, burrs, stems, dirt, and bits of leaves. Once separated, trash must be blown to an incinerator, burr hopper, or trash pile, increasing the gin operator's costs and polluting the air.

Field cleaning is a better alternative. It improves cotton quality and reduces ginning costs for cotton growers. For the gin operator, field cleaning decreases ginning time and lessens wear on equipment in addition to reducing trash disposal problems.

A prototype cleaner for removing the various kinds of trash in the field was tested by ARS agricultural engineer G. N. Franks during the 1967–68

harvest season. Franks found that the cleaner, attached to an ordinary cotton stripper, removed about 60 percent of the trash.

After the field-cleaned cotton was ginned, the early-season type was a full grade higher in quality than under normal circumstances. Late-season cotton showed no improvement, probably because rains and frost caused an off-color.

Field cleaning should eventually be a common practice, Frank says. He conducts research on cotton ginning problems at the U.S. Cotton Ginning Laboratory, Stoneville, Miss.

CAUTION: In using pesticides discussed in this publication, follow directions and heed precautions on pesticide labels. Be particularly careful where there is danger to wildlife or possible contamination of water supplies.

PROTECT
Use Pesticides Safely
FOLLOW THE LABEL

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